Income Parity Standards for Agriculture

By Robert H. Masucci

Parity, or "equality for agriculture," has long been a goal for farmers. Several definitions of parity have been used as a guide to the well-being of farmers, as a basis for the farm programs of the Government, and as a guide to general economic programs aimed at high levels of employment, production, and purchasing power. Yet none has proved entirely satisfactory. Parity has been elusive to define and difficult to measure—especially in the postwar period of rapid changes in agriculture and in the rest of the economy. Farmers, agricultural economists, Congressmen, and many others have frequently criticized the measures of parity currently in use. Congress has found it necessary from time to time to direct changes in parity computations to make programs workable, or to avoid serious inequities. The article presents a new concept of income parity standards for agriculture. Other studies were made in the past by the Department, and Iowa State University recently published a study, *An Alternative Parity Formula for Agriculture,* Research Bulletin 476.

SINCE THE MID-1950's the rate of change in the structure of agriculture has accelerated markedly. The advance in the rate of productivity in 1954–59 was almost double that of the preceding 5-year period. From the Census of Agriculture we find that the number of farms selling $5,000 and more continued to rise between 1954 and 1959. Farms with value of sales of less than $5,000 declined by almost 30 percent, even after allowing for the reduction in numbers due to the change in definition of a farm. Thus developments in the size structure of agriculture continue to be characterized by (1) a relatively stable number of commercial farms, which are for the most part family owned and operated, and (2) a continuing decline in the number of smaller scale farms whose operators are turning more to nonfarm pursuits.

This is illustrated by table 1, which shows average net family income, by major economic classes, from farm and off-farm sources. Total family income includes (1) the net cash income received by the farm operator for farm capital investment, and for his and his family's management and labor; (2) non-money income from the farm from the use of the farm dwelling and farm furnished food; and (3) income received from off-farm sources, such as wages the operator and members of his family receive from other jobs.

Average total family income for the two top classes, which include farms with value of sales of $5,000 and more, was $7,763 in 1959. This is about the same as the $7,785 average for non-farm families, but the average farmer in this category had an *investment in productive assets* of over $86,000. For farms with sales of less than $5,000 total family income averaged $3,750. Net cash farm income for the two top classes substantially exceeded off-farm income, but was lower for the other classes.

It seems clear that the income problems of farms in the classes with sales of $5,000 and more are different from those of the other groups. These farms represent commercial agriculture. They account for 87 percent of the total value of farm products sold and thus are the chief recipients of the benefits of our commodity price and income support programs. Farms with sales of less than $5,000 have had to rely more and more on nonfarm opportunities to improve income status.

Legislation enacted in 1936 and in 1938 defined income parity in terms of the maintenance of a historical ratio between the per capita income of the farm population and that of the non-farm population. The 1936 legislation defined income parity in terms of the per capita income of the farm population from all sources, both farm and nonfarm, while the 1938 legislation related to income from farming operations only. Both concepts referred to the entire farm population, including hired workers.

Despite the fact that average per capita farm income for all farms combined has been much lower than the average per capita income of nonfarmers, per capita farm income for 1959 was at or above income parity under either of the above definitions. Calculations based on the old definition of a farm and unrevised estimates of the farm

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TABLE 1.—*Average net income of farm operator families, by major economic classes, U.S., 1959*

Economic class	Number of farms 1959		Percent of sales of farm products	Average net income of farm operator families			
	Total	Percent of total		Net cash farm income [1]	Off-farm income	Total cash income	Total income including non-money income from farm food and housing
Commercial:							
Farms with sales:	*000*	*Percent*	*Percent*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
$10,000 and over	795	21. 5	71. 9	6, 636	1, 978	8, 614	9, 960
$5,000 to $9,999	654	17. 6	15. 4	2, 165	1, 567	3, 732	5, 018
$2,500 to $4,999	618	16. 7	7. 4	1, 288	2, 077	3, 365	4, 572
$50 to $2,499	349	9. 4	1. 5	438	525	963	1, 476
Other farms:							
Part-time [2]	888	23. 9	2. 7	176	4, 283	4, 459	4, 890
Part-retirement [3]	404	10. 9	1. 1	116	1, 846	1, 962	2, 363
Farms with sales $5,000 and over	1, 449	39. 1	87. 3	4, 618	1, 826	6, 444	7, 763
Farms with sales of less than $5,000	2, 259	60. 9	12. 7	510	2, 589	3, 099	3, 750
All farms	3, 708	100. 0	100. 0	2, 115	2, 247	4, 362	5, 275

[1] Cash receipts from farm marketings plus Government payments less production expenses.
[2] Value of sales less than $2,500, operator under 65 years of age and either worked off farm 100 days or more or income of family from non-farm sources greater than value of products sold.
[3] Value of sales less than $2,500, operator 65 years or older.

population showed per capita income of the farm population in 1959 to be about at parity with the non-farm population. When the new definition of a farm and farm population estimates consistent with it were used, the 1959 per capita income of the farm population was about one-fourth above income parity.

In this paper we are exploring the possibility of comparing the returns to investment and to labor in agriculture to returns to similar resources outside of agriculture. For this purpose, we are considering two groups of farmers: First, commercial farmers whose sales total $5,000 or more; and, second, non-commercial farmers with total sales of less than $5,000. In effect, this approach would divide goals and programs to meet income problems of farmers into two "packages," each designed to measure the income difficulties of the two distinct operator groups in agriculture.

For the first group we apply a concept which calls for returns to investment and operators' and family labor comparable to returns received in the non-farm economy. The goal or standard would be parity of returns to efficiently employed resources used in commercial production. This goal in effect states that farmers who operate on a relatively large-scale basis should receive rates of returns for their labor and capital equal to the average rates received by non-farm resources employed in non-farm pursuits. Commodity oriented price or income programs may then be developed to help commercial farmers to meet such income goals or standards.

For the second group—those selling less than $5,000—it may be appropriate to have an income goal or standard equivalent to average income of non-farm families. This goal would be achieved through programs for full development of rural resources. Although well-conceived commodity programs will help alleviate the income problem of this group, only one dollar out of every five earned as cash income by such families is derived from the farm.

The main emphasis of this study is on the development of a parity of returns standard for commercial farms.

The concept of parity of returns developed in the present study is defined as follows:

TABLE 2.—*Parity returns to commercial farmers, 1961* [1]

	Millions of dollars
1. Productive investments in commercial agriculture—5% return on $134,533	= 6,726
2. Hired Labor—2,532 million man-hours at $1.25	= 3,165
3. Labor of operators and their families—3,299 million man-hours at $2.32	= 7,654
4. Parity returns to commercial farmers	=17,545
5. Actual income originating in commercial agriculture	=14,495
6. The gap (difference between parity returns and actual income)	= 3,050
7. Gross income of commercial farmers	=34,111
8. Percentage increase required in gross income	= 9

[1] Farms with value of sales of $5,000 and over.

Parity returns to commercial farmers are those required to make the rate of return to labor and capital in commercial agriculture in the aggregate equal to the rate of return to comparable labor and capital in other segments of the economy.

The advantages of this definition will be developed in more detail later. Here, we shall comment only briefly on four aspects of the definition.

First, this is a concept of *parity returns* rather than of *parity prices.* Income is a better measure of well-being of farmers than prices alone. Of course, in carrying out farm programs, parity returns could be translated into prices.

Second, the definition applies only to commercial farmers—those who make most of their living from agriculture. It is not feasible to devise a measure of adequate incomes *from farming* for *non-commercial* farmers since their income problems are not met satisfactorily by commodity programs. Programs for the development of rural resources offer a better approach.

Third, the definition is in terms of equality of rates of earnings. It is based upon the earnings of the commercial farmer as a worker and as a businessman with a large investment.

Finally, the definition is in terms of the aggregate of income for all commercial farms combined, rather than by commodity, by type of farm, or by region.

The concept of parity returns as described above can be measured objectively. For example, the computation of parity returns for 1961 would be as shown in table 2—allowing 5 percent return on investment, the Federal minimum wage of $1.25 an hour for hired labor, and the average factory wage rate of $2.32 an hour for the labor of operators and their families. The computed parity of return for 1961 is 9 percent above actual returns to resources used in commercial agriculture in that year.

Legislative History of the Parity Concept

The unit of purchasing power approach to parity upon which the present parity price formula is based has been essentially unchanged for more than a quarter century. The present official parity index—the index of prices paid by farmers, including interest, taxes, and wage rates—has been somewhat modified over the years. Refinements have been made from time to time to adjust weighting periods and to add features designed to improve the index as a tool for helping to achieve the initial objective of "parity" for farmers.

Essentially, the unit of purchasing power concept of parity is simple. It was quickly seized upon by those concerned with the pressing problems of farmers. This often happens with simple concepts in periods requiring urgent action.

This notion of parity was included in the Agricultural Adjustment Act of 1933. The word "parity" was not used, but the concept of unit purchasing power was implicit in the stated objective, "to reestablish prices to farmers at a level that will give agricultural commodities a purchasing power with respect to articles that farmers buy, equivalent to the purchasing power of agricultural commodities in the base period. The base period in the case of all agricultural commodities except tobacco shall be the prewar period, August, 1909—July, 1914. In the case of tobacco, the base period shall be the postwar period, August 1919—July, 1929."

The word "parity" was first used in legislation in the Agricultural Adjustment Act of 1938 in which the stated purpose was "assisting farmers to obtain insofar as practicable, parity prices for such commodities and parity of income . . ." In general, the act provided for: (1) Specific adjustments in the computation of the parity index, such as those calling for the inclusion of new items; (2) the computation of "comparable prices" for items for which price data were nonexistent during the base period, since such commodities at that time were not produced in sufficient quantities; and (3) adjustments to take into account changing relationships over time among the prices of individual agricultural commodities.

The concept of parity in terms of unit purchasing power was generally recognized as being of only limited usefulness as a guide for achieving parity of income. This was reflected in the fact that the concept of income parity was included in several pieces of legislation beginning in 1936.

For example, the Soil Conservation and Domestic Allotment Act of 1936 declared as its purpose the "reestablishment, at as rapid a rate as the Secretary of Agriculture determines to be practicable and in the general public interest, of the ratio between the purchasing power of the net income per person on farms and the income per person not on farms that prevailed during the 5-year period, August, 1909—July, 1914, inclusive, as determined from statistics available in the United States Department of Agriculture, and the maintenance of such ratio."

For practical purposes, this definition of income parity proved ambiguous—so much so that a new definition was embodied in the Agricultural Adjustment Act of 1938. This legislation included the following: " 'Parity,' as applied to income shall be that per capita net income of individuals on farms from farming that bears to the per capita net income of individuals not on farms, the same relation as prevailed during the period from August, 1909—July, 1914."

This definition made it much simpler to compute a measure than the earlier one did since it merely required that ratios of per capita net income of persons on farms from farming to per capita net income of persons not on farms be computed for the base period specified and for subsequent years. However, it still fell short of achieving general acceptance as a measure of income parity which represented an equitable share of the total national income for farmers. As a result, the definition was changed again in the Agricultural Act of 1948, which read that " 'Parity,' as applied to income shall be that gross income from agriculture which will provide the farm operator and his family with a standard of living equivalent to those afforded persons dependent upon other occupations."

That Act also applied the concept of parity income to individual commodities, stating that " 'Parity,' as applied to income from any agricultural commodity for any year, shall be that gross income which bears the same relationship to parity income from agriculture for such year as the average gross income from such commodity for the preceding ten calendar years bears to the average gross income from agriculture for such ten calendar years." This provision for individual commodities depended upon a determination of parity gross income, which in turn, required a measurement of gross income. In addition, measures of differences in levels of living as between persons living on farms and those not living on farms were required. The difficulties of computation involved in making such definitions meaningful were so great that, to date, measurements under the provision of the Act have not been attempted.

To summarize, enacted legislation to date has incorporated the following concepts of parity: (1) Price parity, or unit of purchasing power parity; (2) income parity based on the historical ratio of the *purchasing power* of the net income per person on farms to income per person not on farms; (3) income parity based on merely a historical ratio, regarded as normal, of the per capita net income of individuals on farms from farm operations to the per capita net income of individuals not on farms; and (4) income parity based on equality of incomes in absolute terms with adjustments for differences in living standards.

Parity of Returns Alternative to Unit of Purchasing Power Parity

Generally speaking, the unit of purchasing power concept of parity is relatively simple in terms of definition, scope, and practical measurement. Moreover, the experience gained in almost 30 years of its application plus the many refinements made in the construction of the indexes of prices paid and prices received by farmers give it

a sanction of historical practicability. This does not mean, however, that the concept and measures now in use should not be continuously examined and reappraised in terms of whether they are performing the function originally conceived for them and, if not, whether new concepts and measures might be substituted.

The present parity concept has been continuously appraised by agricultural specialists during the years it has been in use. Some have cited several major limitations, including (1) remoteness of the 1910–14 base for the indexes of prices paid and received by farmers; (2) failure to reflect cost rates for individual commodities by applying the index of prices paid, including interest, taxes, and wage rates, to all agricultural commodities; (3) unresponsiveness to changes in input composition even for all of agriculture combined because the parity index reflects changes in prices of inputs, but not quantities; and (4) failure to measure the income position of farmers either absolutely or relatively, since the parity price ratio reflects only the purchasing power of a unit of farm commodities relative to its purchasing power in a base period.

These limitations have led to several investigations into the feasibility of developing alternative concepts of parity and methods of measuring it. In 1957, pursuant to Section 602 of the Agricultural Act of 1956, the U.S. Department of Agriculture reported to the Senate the results of a comprehensive study of possible methods of improving the parity formula.[1] More recently, a comprehensive study of an alternative parity formula for agriculture was made by staff members of Iowa State University under a subproject of the Interregional Committee on Agricultural Policy.[2]

This paper utilizes aggregative data on farm income and on selected farm balance sheet items to develop a standard of parity returns to resources used on commercial farms with a value of sales of $5,000 or more. This involves the determination of (1) the composition of resources on which parity of returns are to be sought, and (2) average rates of return to inpute to such resources.

With respect to the composition of resources, questions arise as to whether we should include hired workers, resources owned by landlords as well as owner operators, and borrowed capital as well as equity capital.

The unit of purchasing power standard involves the average price relationship of all inputs to that of all outputs. Theoretically, therefore, it covers all capital resources and all labor inputs; that is, all factors of production in agriculture are included whether such factors are hired workers, nonfarm or farm landlords, and nonfarm holders of claims against farmers. The labor of hired workers, and the resources of non-farm landlords and non-farm holders of claims all constitute resources employed in agriculture, but they are not owned or provided by farm operators or their families. Under the parity returns concept, the question arises as to whether these factors also should realize parity of returns for their contributions.

All of the above resources are included in the total of resources employed for purposes of developing the parity of returns standard used in this study. They all contribute either labor or capital to the production process.

Rates of returns for operator and family labor were considered to be parity returns rates if they equalled the average hourly earnings of all employees in manufacturing. This was based on the assumption that the degree of skills required to perform farm operations is on the average somewhat lower than that of employees in manufacturing, but that the management function performed by operator and family labor just about offsets this difference in skills. For hired labor, on the other hand, a rate equal to the prospective minimum wage of $1.25 was employed. Such a rate would permit farmers to pay hired workers the national minimum wage rates already provided for other groups of workers in existing legislation.

For farm capital or productive assets the computations of parity of returns for 1961 assume a rate of 5 percent. This was about equal to the weighted average interest rate paid on all farm mortgage loans outstanding in 1961, but somewhat lower than the rate of interest on new mortgage loans.

[1] For details of this report, see *Possible Methods of Improving the Parity Formula.* Report of the Secretary of Agriculture Pursuant to Section 602 of the Agricultural Act of 1956, Senate Document No. 18, 85th Congress, 1st Session, 1957.

[2] See *An Alternative Parity Formula for Agriculture.* Research Bulletin 476, Agricultural and Home Economics Experiment Station, Iowa State University, Ames, Iowa, February, 1960.

TABLE 3.—*Estimated income originating in agriculture, parity of returns to agricultural resources, and increases in gross farm income necessary to achieve parity of returns by major sales classes, 1961*

	Farms with sales				
	Over $5,000	$2,500 $4,999	Over $2,500	Under $2,500	All farms
1. Number of farms—thousands	1,550	560	2,110	1,701	3,811
2. Cash receipts from farm marketings plus government payments—dollars in millions	32,549	2,190	34,739	1,997	36,736
3. Value of home consumption—do	583	183	766	413	1,179
4. Rental value of farm dwellings—do	979	223	1,202	804	2,006
5. Gross farm income, lines (2)+(3)+(4)—do	34,111	2,596	36,707	3,214	39,921
6. Production expenses—do	24,410	1,282	25,692	1,417	27,109
7. Realized net farm income, line (5)—line (6)—do	9,701	1,314	11,015	1,797	12,812
8. Total wages of hired workers—do	2,822	104	2,926	122	3,048
9. Net rent paid to nonfarm landlords—do	877	76	953	154	1,107
10. Interest paid by farmers—do	1,095	95	1,190	193	1,383
11. Total net income originating in Agriculture, lines (7)+(8)+(9)+(10)—dollars in millions	14,495	1,589	16,084	2,266	18,350
12. Total productive assets in Agriculture—do	134,533	14,094	148,627	29,773	178,400
13. Total labor used—million hours	5,831	1,247	7,078	3,058	10,136
(a) Hired workers—do	2,532	93	2,625	110	2,735
(b) Operators and family workers—do	3,299	1,154	4,453	2,948	7,401
14. Estimated parity returns on productive assets plus labor: Assuming 5.0 percent yield on assets, minimum wage of $1.25 per hour paid hired labor and $2.32 per hour return for operator and family labor—dollars in millions	17,545	3,498	21,043	8,466	29,509
15. Estimated income gaps: Line 14—line 11—do	3,050	1,909	4,959	6,200	11,159
16. Indicated percentage increases in gross income required: Line 15 ÷ line 5—percent	+9	+74	+14	+193	+28

While rates employed for labor and capital in this study are believed to be close to what may be considered reasonable, they are by no means the only rates for which a strong and reasonable case might be made. They do, however, provide a reasonable illustration of how the standard of parity of returns might be developed computationally.

Some idea of the range of the computed adjustments necessary to achieve parity of returns under different assumptions of rate of returns may be obtained by comparing the results shown in table 3 for farms with sales of $5,000 and over, with results of computations using different assumptions. For example, if a 3.5 percent return were imputed to productive assets on farms with sales of $5,000 or more, instead of the 5 percent used in table 3, and if labor returns were assumed to be the same as in table 3, an adjustment percentage in gross income of about 3 percent is indicated. This compares with the 9 percent adjustment shown in table 3 for farms with value of sales $5,000 and over.

If, in addition to an imputed rate of return to farm capital of 3.5 percent, we were to assume that hired labor were to be paid the actual average composite wage for such labor in 1961 of 83 cents per hour, an adjustment of less than 1 percent is indicated.

One further observation is appropriate at this point. The parity returns standard computed on the basis of aggregative data relates to all commercial farms combined. This implies a concept of an average farm. It does not purport to measure parity of returns for each and every farm within the group, or even the different types of farms within the group. It merely represents income adjustments necessary for an average commercial farm to realize parity of returns for resources used. For farms of above-average efficiency such indicated adjustments may well result in windfall returns above the indicated average. For those below, it will tend to encourage efficiency of operations so that they too can realize parity of returns on efficiently utilized resources.

TABLE 4.—*Per farm estimated income originating in agriculture, parity of returns to agricultural resources, and increases in gross farm income necessary to achieve parity of returns by major sales classes, 1961*

	Farms with sales				
	Over $5,000	$2,500 $4,999	Over $2,500	Under $2,500	All farms
1. Gross farm income: Item 5, table 3—dollars	22,007	4,636	17,397	1,889	10,475
2. Total net income originating in Agriculture: Item 11, table 3—dollars	9,352	2,838	7,623	1,332	4,815
3. Total productive assets in Agriculture—do	86,795	25,168	70,439	17,503	46,812
4. Total labor used—hours	3,762	2,227	3,354	1,798	2,660
(a) Hired workers—do	1,634	166	1,244	65	718
(b) Operators and family workers—do	2,128	2,061	2,110	1,733	1,942
5. Estimated parity returns on productive assets plus labor: Assuming 5.0 percent yield on assets, minimum wage of $1.25 per hour paid hired labor and $2.32 per hour return for operator and family labor—dollars	11,319	6,246	9,973	4,977	7,743
6. Estimated income gaps: Line 5 — line 2—do	1,967	3,408	2,350	3,645	2,928
7. Indicated percentage increases in gross income required: Line 6 ÷ line 1—percent	+9	+74	+14	+193	+28

Computation of Measures of Parity Returns

Tables 3 and 4 illustrate, for the year 1961, the measurement of gaps between actual returns to capital and labor resources used in agriculture and parity of returns to such resources with those employed in nonagricultural enterprises.

Such measurements are shown by major sales groups and for all groups combined in aggregate dollars in table 3, and on an average per-farm basis in table 4.

In table 3, actual returns to resources used in agriculture, or net income originating in agriculture (line 11) consist of (1) the realized net income of farm operators (line 7), that is, net returns to farm operators for their labor, management, and capital; (2) total wages of hired workers (line 8); (3) interest paid by farmers (line 10); and (4) net rent to nonfarm landlords (line 9). In concept, these are all shares distributed to productive factors for either their labor or their capital contribution.

For the computations of returns to resources two measures were required: Total productive assets used in agriculture (line 12)—farm real estate, farm machinery and equipment, farm product inventories and an allowance for working capital—and total man hours of labor, both hired and family, required for farm production in 1961 (line 13). Unit rates of return for capital and labor were applied to the total productive assets and labor used in agriculture in 1961 to derive estimates of comparable or parity returns. Line 14 in table 3 shows the results of these computations and represents *parity returns to agricultural resources* for the different economic classes of farms and for all farms combined. For these computations, hired labor was assumed to be paid the prospective minimum wage of $1.25 per hour, while operator and family labor were assumed to be paid at the factory wage rate of $2.32 per hour.

Line 15 shows the estimated gaps that existed in 1961 between actual returns to resources used in agriculture and parity of returns to agriculture as shown in line 14. Such estimated gaps in aggregative dollar terms are then divided by actual gross farm income in 1961, and shown in line 16 as the indicated increases in total gross income in 1961 necessary to achieve parity of returns to resources employed in agriculture.

Parity of returns standards for individual types of farms, or even for major commodities, is an alternative to the development of a parity of returns standard for all farms combined. The Iowa State University study uses this type of farm approach, utilizing the regularly published data for commercial farms, by type and location, covered in the U.S. Department of Agriculture's Farm Costs and Returns Series.

The computed average adjustment in gross income for all farms in the United States is the

same under both methods, assuming (1) equal rates of returns for both the type of farm approach used in the Iowa State University study and the aggregative approach, and, (2) type of farm cost data are expanded to cover all types of farms in all regions. This is demonstrated in Appendix B of this article.

Utilizing the same data, a type-of-farm approach was also explored in this study.

The results of the computations are shown in table 5. For these calculations, the same rates of returns were assumed for operator and family labor and for invested capital as were used in the computations using aggregative data. In addition, normalized yields and abandonment were assumed. As can be seen in table 5, this approach reveals not only wide disparities between types of farms, but also those existing within given types, in the adjustments in gross income necessary to yield parity returns to such farms.

For cotton farms, for example, the computed necessary increases range from 85 percent for cotton farms in the Southern Piedmont region to negative increases in the irrigated High Plains region in Texas and the San Joaquin Valley of California. The negative figures indicate, of course, that incomes for these types were actually above parity returns income in 1961, assuming the rates of returns used for computations. There are wide disparities among other types, which are also shown in table 5.

Further examination of table 5 also reveals that, in general, the computed increases required in gross incomes to achieve parity of returns for the 37 farm types are negatively correlated with average total investment or productive assets. Figure 1 suggests that for farms with an average total investment above $75,000, required income adjustments would generally be much smaller than for those with smaller total investments. This is strikingly shown in figure 1. This relationship, of course, is not to be interpreted as simply meaning that all a farmer needs to do to improve his income position is to increase his investment. However, it does suggest that increased efficiency is associated with an increase in total investment up to a given point. This is also generally confirmed by the data shown by the aggregative major class of farm computations of table 3.

For some types of farms, however, figure 1 and table 5 show that even with relatively large investment, incomes in 1961 would have required substantial upward adjustments to achieve the parity of returns standard. This suggests that for certain types of producers differential adjustments in incomes or prices, or supply management measures might be appropriate to correct existing wide disparities in the income of the various types of commercial farms and to achieve desirable adjustments in supplies.

In any event, we should emphasize that the computed parity of income standard need not be applied rigidly or mechanically to all commodities. Rather, when supplementary studies indicate that adjustments from the overall changes indicated by the computed standard are desirable, such adjustments can be made and programs to eliminate disparities can be tailored to the needs of such producers.

Appendix A

Adequacy of Available Data for Measuring Parity

Numerous problems of practicability of measurement are encountered in any investigation of income parity in terms of parity returns to resources employed, in addition to questions of the segment of agriculture for which income parity is to be sought and of what is meant by parity of returns to resources employed in agriculture.

The present study employed the aggregative approach to measuring the necessary adjustments in gross farm income to yield parity of returns in the conceptual framework described earlier.

Under the aggregative approach, the computed percentage change for any given year in gross income necessary to achieve parity of returns can be applied to all commodities and all farms of all types, regional differences being determined pretty much as they are under the present unit of purchasing power determinations of parity prices. As we have mentioned earlier, this overall application would fix relationships among agricultural prices at levels determined in large part by market forces and existing programs designed to maintain prices of supported commodities at levels determined to be a certain percentage of parity under the old concept. Basing programs on this approach, therefore, in general would result in

TABLE 5.—*Estimated increases in gross income necessary to achieve parity income on representative commercial farms, 1961* [1]

Type of farm	Total investment	Total labor	Operator and family labor	Necessary increase in gross income with—
				Operator and family at factory workers' rates and hired labor at prospective minimum wage rate
	Dollars	*Hours*	*Hours*	*Percent*
Cotton farms:				
1. Southern Piedmont	26, 300	4, 872	2, 490	84. 7
Mississippi Delta:				
2. Small	13, 840	3, 440	2, 390	73. 5
3. Large-scale	214, 440	33, 535	3, 200	15. 0
4. Black Prairie, Tex	49, 630	3, 116	2, 314	38. 9
High Plains, Tex:				
5. Nonirrigated	60, 750	3, 092	2, 180	21. 2
6. Irrigated	117, 310	7, 685	2, 600	−5. 5
San Joaquin Valley, Calif.:				
7. Cotton-general (medium-sized)	275, 530	10, 010	2, 600	−3. 2
Cotton-general (large)	944, 860	30, 350	2, 600	−8. 4
8. Cotton-specialty	278, 360	12, 735	2, 600	10. 5
Peanut-cotton farms:				
9. Southern Coastal Plains	17, 180	4, 002	2, 980	49. 6
Winter wheat farms:				
Southern Plains:				
10. Wheat	96, 310	2, 960	2, 610	23. 4
11. Wheat-grain sorghum	89, 440	3, 030	2, 770	25. 8
Pacific Northwest:				
12. Wheat-pea	175, 280	3, 490	2, 750	9. 1
13. Wheat-fallow	148, 280	3, 670	3, 020	11. 5
Spring wheat farms:				
Northern Plains:				
14. Wheat-small grain-livestock	52, 110	2, 080	1, 640	13. 8
15. Wheat-corn-livestock	52, 870	3, 890	3, 700	55. 0
16. Wheat-roughage-livestock	49, 070	2, 730	2, 530	59. 0
Dairy farms:				
17. Central Northeast	41, 500	4, 440	3, 620	47. 4
Eastern Wisconsin:				
18. Grade A	62, 350	4, 460	4, 000	38. 5
19. Grade B	41, 170	3, 670	3, 580	79. 8
20. Western Wisconsin, Grade B	32, 860	4, 190	3, 900	73. 1
21. Dairy-hog farms: Southeastern Minnesota	49, 860	4, 060	3, 760	70. 2
Corn Belt farms:				
22. Hog-dairy	56, 720	4, 260	3, 830	48. 7
23. Hog fattening-beef raising	51, 500	3, 530	3, 290	72. 2
24. Hog-beef fattening	86, 770	4, 200	3, 650	22. 5
25. Cash grain	105, 940	3, 130	2, 820	25. 0
Poultry farms:				
26. New Jersey (egg producing)	44, 740	5, 250	4, 350	29. 7
Cattle ranches:				
27. Northern Plains	83, 890	3, 650	3, 360	48. 5
28. Intermountain region	86, 080	5, 020	4, 000	26. 6
29. Southwest	160, 700	3, 590	2, 350	33. 2
Sheep ranches:				
30. Northern Plains	96, 740	7, 190	4, 020	41. 7
31. Southwest	205, 200	6, 100	2, 550	41. 7
Tobacco farms:				
North Carolina Coastal Plain:				
32. Tobacco-cotton	25, 970	5, 467	2, 370	43. 7
33. Tobacco-cotton (large)	44, 880	8, 693	2, 530	42. 1
34. Tobacco (small)	12, 940	3, 056	2, 688	49. 9
Kentucky Bluegrass:				
35. Tobacco-livestock, inner area	100, 170	4, 680	2, 810	29. 5
36. Tobacco-dairy, intermediate area	22, 130	3, 510	3, 330	106. 1
37. Tobacco-dairy, outer area	41, 250	4, 690	4, 060	59. 7

[1] Returns are estimated at 1959 prices and cost rates with 1959 production adjusted for normal yield and abandonment. Returns to capital are estimated at 5.0 percent. Non-farm labor rates are estimated at the regional representative rate for manufacturing industries (U.S. average of $2.32 per hour). The farm wage rates are what was actually paid in each region. Prospective minimum wages are $1.25 per hour.

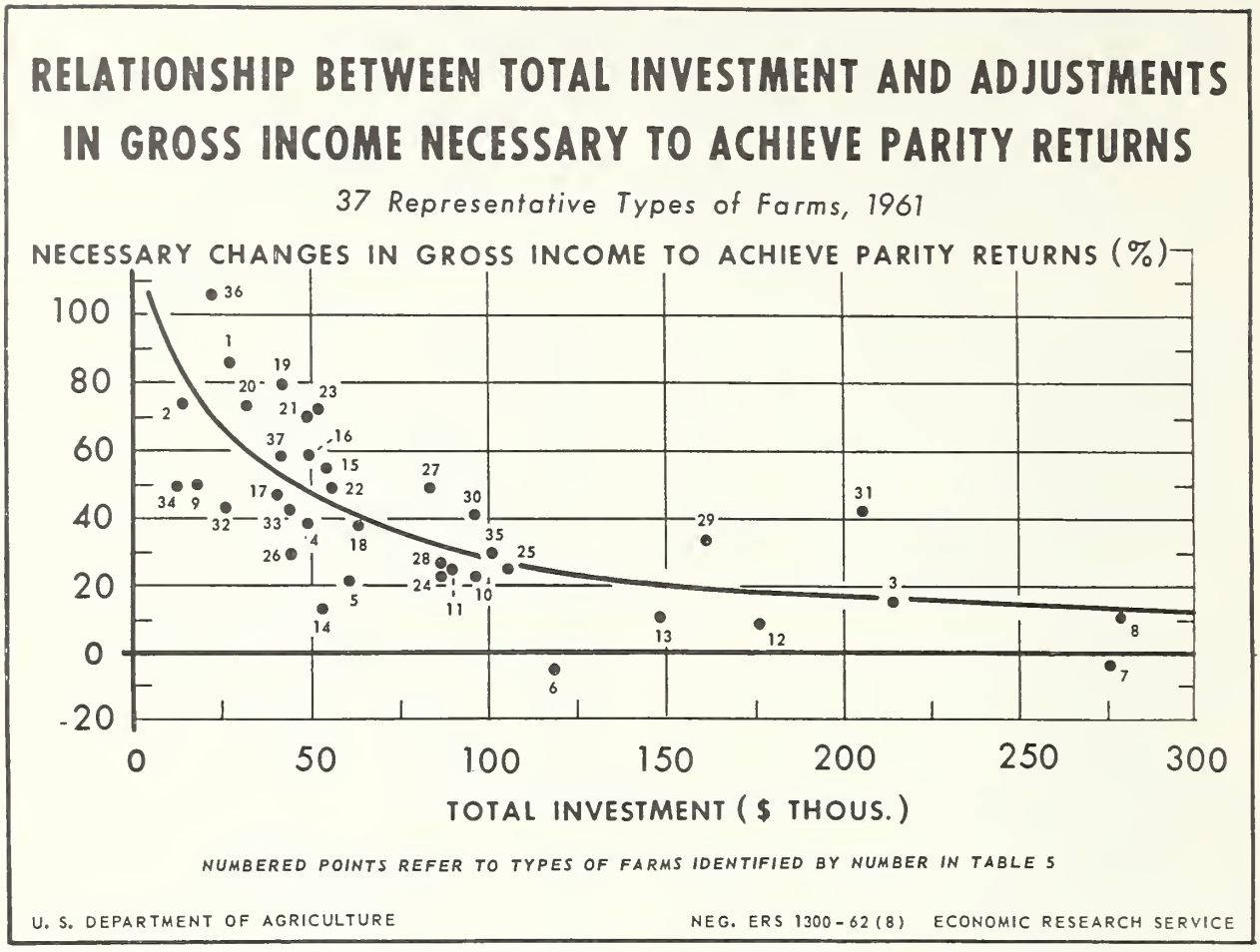

FIGURE 1.—Relationship between total investment and adjustments in gross income necessary to achieve parity returns, 37 representative types of farms, U.S., 1961

the least disruption of existing relationships as between prices of agricultural commodities.

The measurement on the aggregative basis illustrated in table 3 has incorporated in it some rather rough estimates of major class distributions of gross farm income, expenses, net income, labor employed, and capital resources. On the other hand, data on unit rates of returns such as the interest rates on mortgage debt and the hourly wage rates of manufacturing employees are readily available. For the computation of resources applied in agriculture the principal improvement required in the estimates would be in the determination of the distribution of total man-hour equivalents of labor applied and capital resources applied between those farms above and below the point of segmentation. In other words, if farms above $5,000 in sales are to be covered in the concept and measurement, then present aggregative estimates of labor resources applied and capital assets in agriculture must be divided between these two groups of farms. As of now, fairly reasonable estimates can be made by use of existing series, but more refined calculations of the distribution of cash receipts, expenditures and capital resources applied by major economic class groups would depend on the gathering of such information by means of periodic surveys.

Appendix B

Reconciliation of Iowa State Method of Determining Parity Returns and Prices With That Used in This Study

Aside from the problem of determining the unit return rates to be applied to agricultural resources

used, the type of farm approach such as that used by Iowa State may be reconciled in its mechanics and scope with the aggregative approach used in the ERS study.

In the Iowa State study derivation of parity returns prices for specific commodities, such as wheat, corn, dairy products and so forth, type of farm cost data are first combined with imputed parity returns for labor, land, and capital to arrive at a parity gross income measure for certain types of farms within a geographic area. The parity gross income measure is then (1) converted to a ratio relationship to an average of "normal production gross income" for such farms based on some estimate of normal production of specific commodities and average prices of such commodities for the preceding ten years and (2) applied to the preceding ten-year average of actual prices for a specific major commodity produced by that type of farm in that area to yield dollars and cents estimates of parity returns prices for the major commodity.

Parity returns prices for other commodities produced in the area are computed in terms of major commodity equivalents on the basis of the preceding ten-year average relationship of prices of all the various commodities to the major commodity produced by such types of farms.

The Iowa State Study thus uses type-of-farm cost data to arrive at a "representative" measure of aggregative parity gross income and average normal production gross income. These are then applied to an average of actual "market" prices for a major commodity to derive parity returns prices.

For each region, the product of (1) the ratio of parity gross income to the average of normal production gross income for the preceding ten years and (2) the preceding ten-year average price of a major commodity or its equivalent forces proportionate adjustments in prices for all commodities produced by such farms in that region. This, in effect, is the same as measuring aggregative income gaps for a region by using type-of-farm cost data as representative of the cost and income experience of all farms in that region and applying the indicated percentage adjustment as reflected by the "income gap" to a ten-year average price of each commodity produced by such farms in the region.

Income parity prices arrived at in this way for each region producing the same commodity are then combined by use of a simple average of prices of each of the rather small producing regions to derive a U.S. average for all such regions.

Essentially, then, there is no real difference between the general approaches used in this study and the Iowa State study, except of course for the estimation and application of unit rates of return to capital and labor and the comparison of parity gross income to an average normal production gross income for the preceding ten years. As a matter of fact, the Iowa State approach measures average income gaps or parity returns indicators, and average parity prices by means of simple averages.

Estimated income gaps shown in table 3, as developed in the Economic Research Service study, compare parity returns income with actual yield income for the preceding year. If, instead of the actual yield income for the preceding year, an average of normal production gross income for the preceding ten years were used, the parity returns indicators, in concept, would be generally the same as was used by the Iowa State group. And if the resulting percentage were then applied proportionately to the preceding ten-year average price for each agricultural commodity produced in the U.S., a system of parity returns prices for the U.S. would be determined similar to those developed by the Iowa State University study. But the system of U.S. average parity returns prices for the various commodities derived by the use of the aggregative method in this study is *a system of weighted averages of regional prices for each commodity, as computed by the Iowa State method, with the proportions of normal production gross income in each region to the total normal production gross income in the U.S. used as weights.*

What follows is an algebraic demonstration of the essential similarity of both methods.

For simplicity, and without loss of generality, let us assume that (1) agriculture consists of three types of farms, each located in a different region and; (2) each type of farm produces the same three commodities. Further, let us assume that four periods are involved—the current period, and three preceding periods. We shall denote the commodity produced by the subscript "i", the type of farm by the subscript "j" and the year by the

superscript "k", where the values of "i" and "j" run from 1 to 3 and of "k" from 1 to 4.

Now let us define:

O_{ij}^k as the output of the ith commodity on the jth farm in the kth period;

P_{ij}^k as the average price received for the ith commodity on the jth farm in the kth period;

I_{ij}^k as the input of the ith commodity, service or factor on the jth farm in the kth period; and

p_{ij}^k as the average price paid or imputed to the ith input on the jth farm in the kth period.

For each type of farm, total gross receipts from all commodities during the kth period will then be equal to

$$\sum_{i=1}^{3} P_{ij}^k O_{ij}^k$$

For all farms combined in the kth period, gross receipts is given by:

$$\sum_{j=1}^{3}\sum_{i=1}^{3} P_{ij}^k O_{ij}^k$$

Similarly for the total value of inputs, including those imputed at parity returns rates to labor and capital for each type of farm we have:

$$\sum_{i=1}^{3} I_{ij}^k p_{ij}^k$$

This is the parity returns income for the type of farm for the kth year.

And for all farms combined we have:

$$\sum_{i=1}^{3}\sum_{i=1}^{3} I_{ij}^k p_{ij}^k$$

This is parity returns income for all types of farms for the kth year.

Now the Iowa State formula for computing parity returns prices for a particular commodity in a given region or for a type of farm is given by:

$$(1) \qquad \overline{P}_{ij}^4 = \left(\frac{\sum_{k=1}^{3} P_{ij}^k}{3}\right)\left(\frac{\sum_{i=1}^{3} I_{ij}^4 p_{ij}^4}{\frac{\sum_{k=1}^{3}\sum_{i=1}^{3} P_{ij}^k O_{ij}^k}{3}}\right)$$

To simplify this, let us denote the second factor in parentheses on the right hand side by denoting it as:

$$\frac{\overline{I}_j}{\overline{O}_j}, \text{ where}$$

$\overline{I}_j$ represents the total value of inputs and imputed returns to all farms of type j in the current or 4th period (or parity returns income); and $\overline{O}_j$ is the average of total normalized gross receipts for all farms of this type during the preceding three years or periods. Also let $\overline{P}_{ij}^4$ represent the parity returns income price for the ith commodity in the jth region.

Then (1) may be written as:

$$\overline{P}_{ij}^4 = \overline{P}_{ij}\frac{\overline{I}_j}{\overline{O}_j}$$

The average parity returns price for the U.S. as a whole is thus given by:

$$(2) \qquad \sum_{j=1}^{3} \overline{P}_{ij}^4 = \frac{\overline{P}_{ij}\sum_{j=1}^{3} \overline{I}_j}{\sum_{j=1}^{3} \overline{O}_j}$$

The $\overline{P}_{ij}$'s for each region are all equal in the Iowa State framework since these are all computed for each commodity in terms of primary producing area equivalents.

Now (2) can be written at length as:

$$(3) \qquad \sum_{j=1}^{3} \overline{P}_{ij}^4 = \overline{P}_{i1}\frac{\overline{I}_1}{\overline{O}_1} + \overline{P}_{i2}\frac{\overline{I}_2}{\overline{O}_2} + \overline{P}_{i3}\frac{\overline{I}_3}{\overline{O}_3}$$

This represents the simple average of all parity returns prices for the different regions, or a U.S. simple average price.

However, if instead of a simple average for all regions, we were to compute a weighted average, where weights are equal to the ratios of total gross income in each region to the grand total for the U.S., we would then obtain:

$$\sum_{j=1}^{3} W_j \overline{P}_{ij}^4 = \overline{P}_{i1}\frac{\overline{I}_1}{\overline{O}_1}\left(\frac{\overline{O}_1}{\overline{O}_1+\overline{O}_2+\overline{O}_3}\right) + \overline{P}_{i2}\frac{\overline{I}_2}{\overline{O}_2}\left(\frac{\overline{O}_2}{\overline{O}_1+\overline{O}_2+\overline{O}_3}\right) + \overline{P}_{i3}\frac{\overline{I}_3}{\overline{O}_3}\left(\frac{\overline{O}_3}{\overline{O}_1+\overline{O}_2+\overline{O}_3}\right)$$

$$= \overline{P}_{i1}\left[\frac{\overline{I}_1}{\overline{O}_1+\overline{O}_2+\overline{O}_3} + \frac{\overline{I}_2}{\overline{O}_1+\overline{O}_2+\overline{O}_3} + \frac{\overline{I}_3}{\overline{O}_1+\overline{O}_2+\overline{O}_3}\right]$$

(4)

Since $\bar{P}_{i1}=\bar{P}_{i2}=\bar{P}_{i3}$ in the Iowa State framework.

This simplifies to:

$$\sum_{j=1}^{3} W_j \bar{P}_{ij}=\bar{P}_{i1}\left(\frac{\bar{I}_1+\bar{I}_2+\bar{I}_3}{\bar{O}_1+\bar{O}_2+\bar{O}_3}\right)$$

The factor $\frac{\bar{I}_1+\bar{I}_2+\bar{I}_3}{\bar{O}_1+\bar{O}_2+\bar{O}_3}$ is thus seen to be the ratio of aggregative parity returns income to the average of aggregative actual income for the three preceding years for all 3 types of farms. And the weighted average parity returns price for the ith commodity is seen to be simply the product of this ratio and the average price of the ith commodity for the preceding three years.

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